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Nago

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(54) **TUBE INSERT INSTALLING TOOL**

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(73) Assignee: **Shimano Inc.**, Osaka (JP)

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(51) **Int. Cl.**
B23P 19/04 (2006.01)

(52) **U.S. Cl.** **29/237**; 29/278; 269/96

(58) **Field of Classification Search** 29/237, 29/238, 267–268, 278; 269/96
See application file for complete search history.

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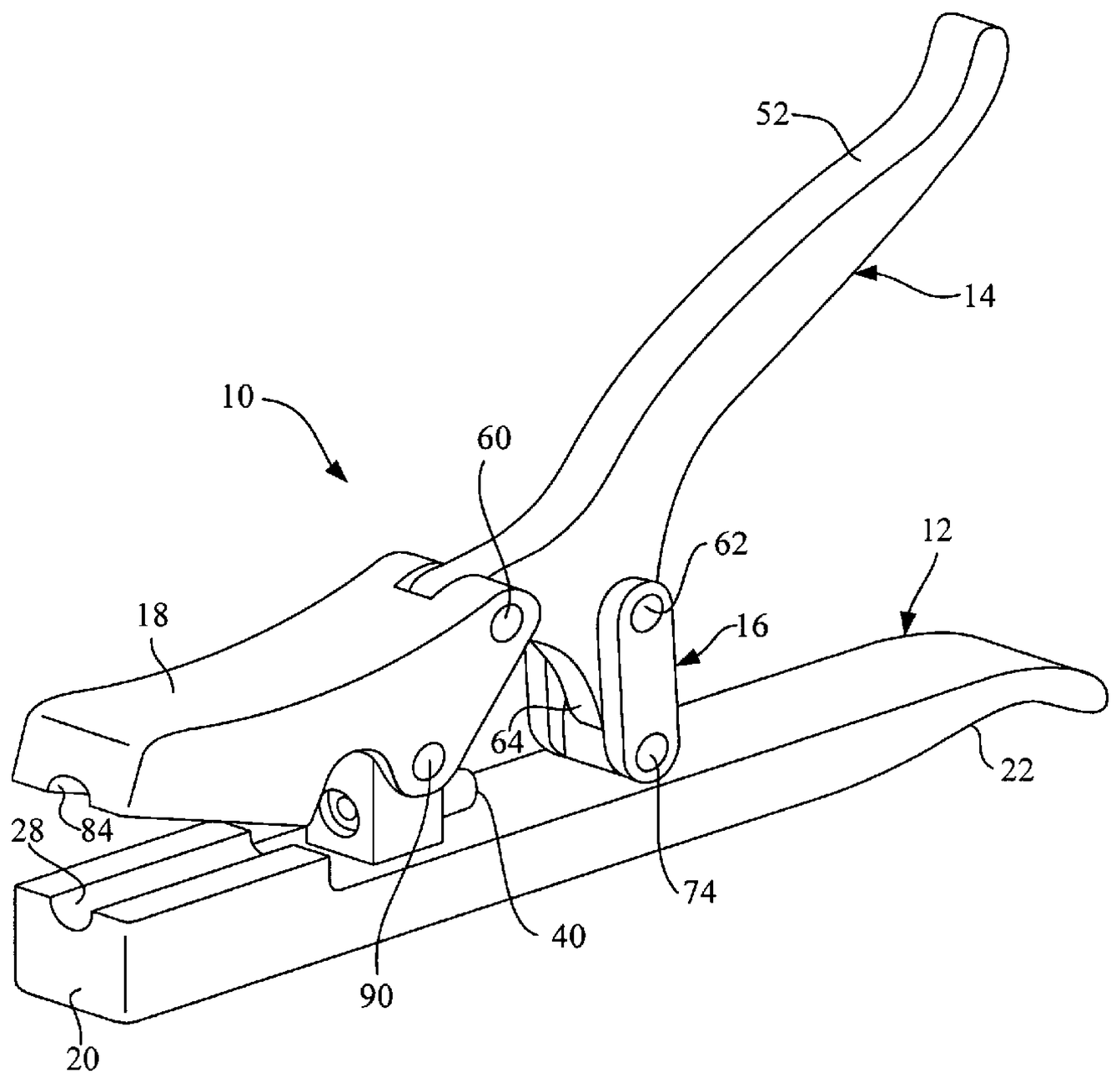
(57) **ABSTRACT**

A tube insert installing tool includes first and second tube gripping portions, a tube insert supporting portion and a user actuation portion. The first and second tube gripping portions are configured to engage an end part of a tube. The tube insert supporting portion is configured to support a tube insert. The user actuation portion is operatively coupled to the first and second tube gripping portions to move the first and second tube gripping portions between an open release orientation and a tube gripping orientation. The user actuation portion includes an insert pressing part configured and arranged to push the tube insert into the end part of the tube during subsequent movement of the user actuation portion in a single movement of the user actuation portion from the open release orientation to a final tube insertion orientation.

20 Claims, 7 Drawing Sheets



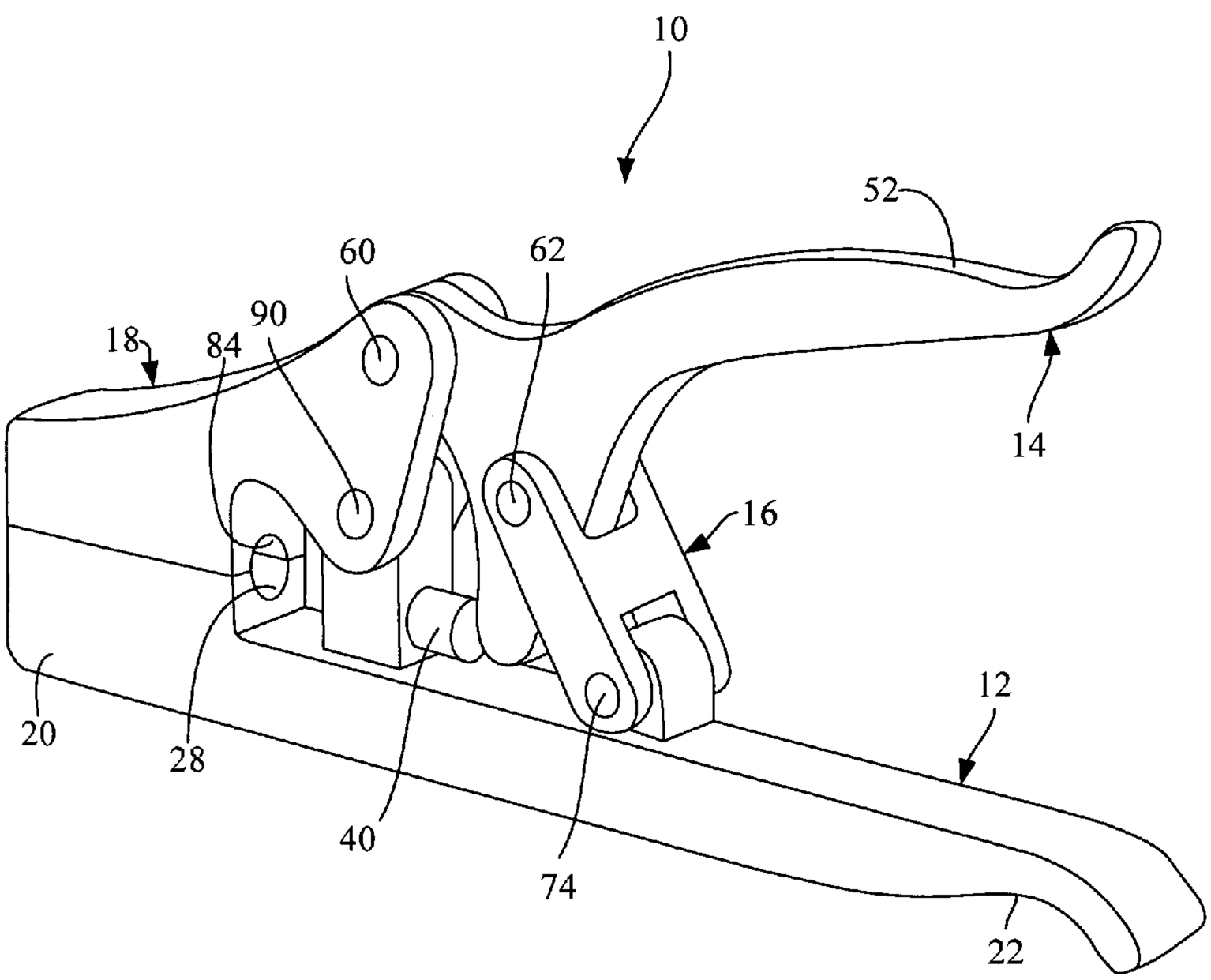


Fig. 1

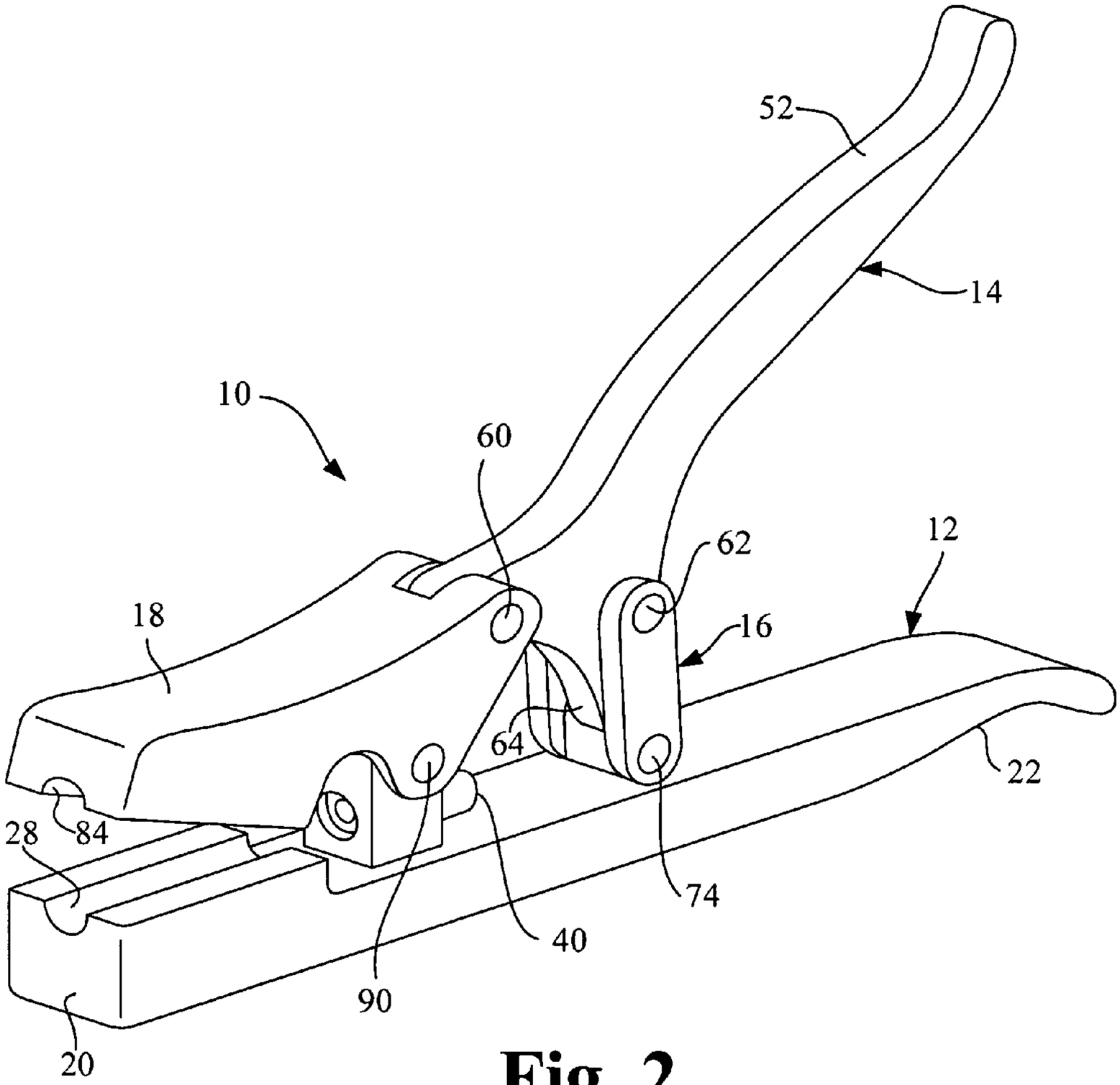


Fig. 2

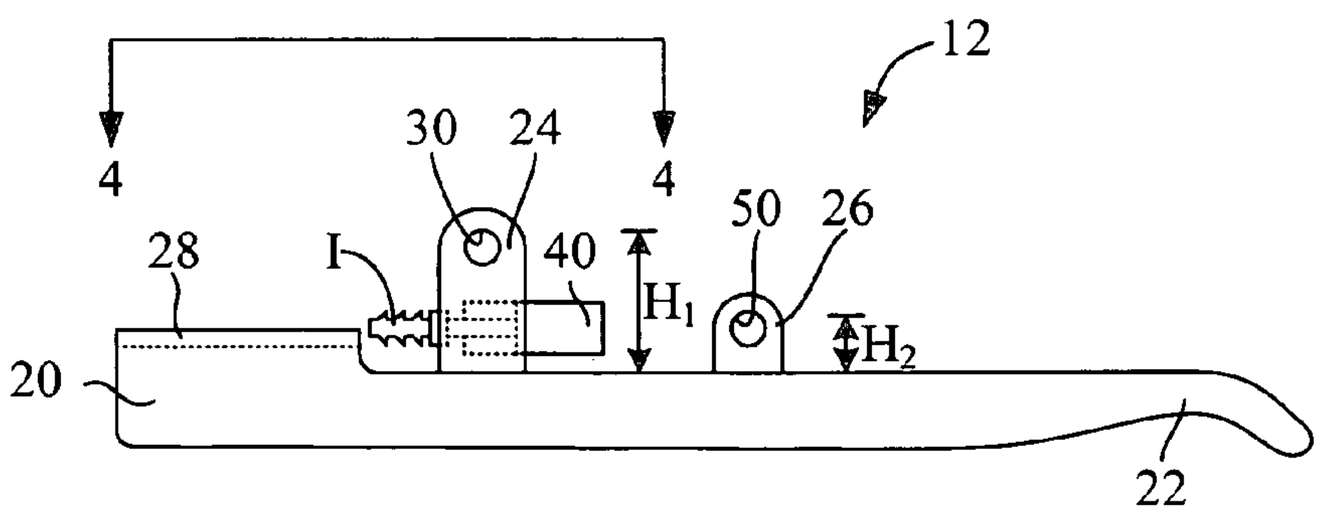


Fig. 3

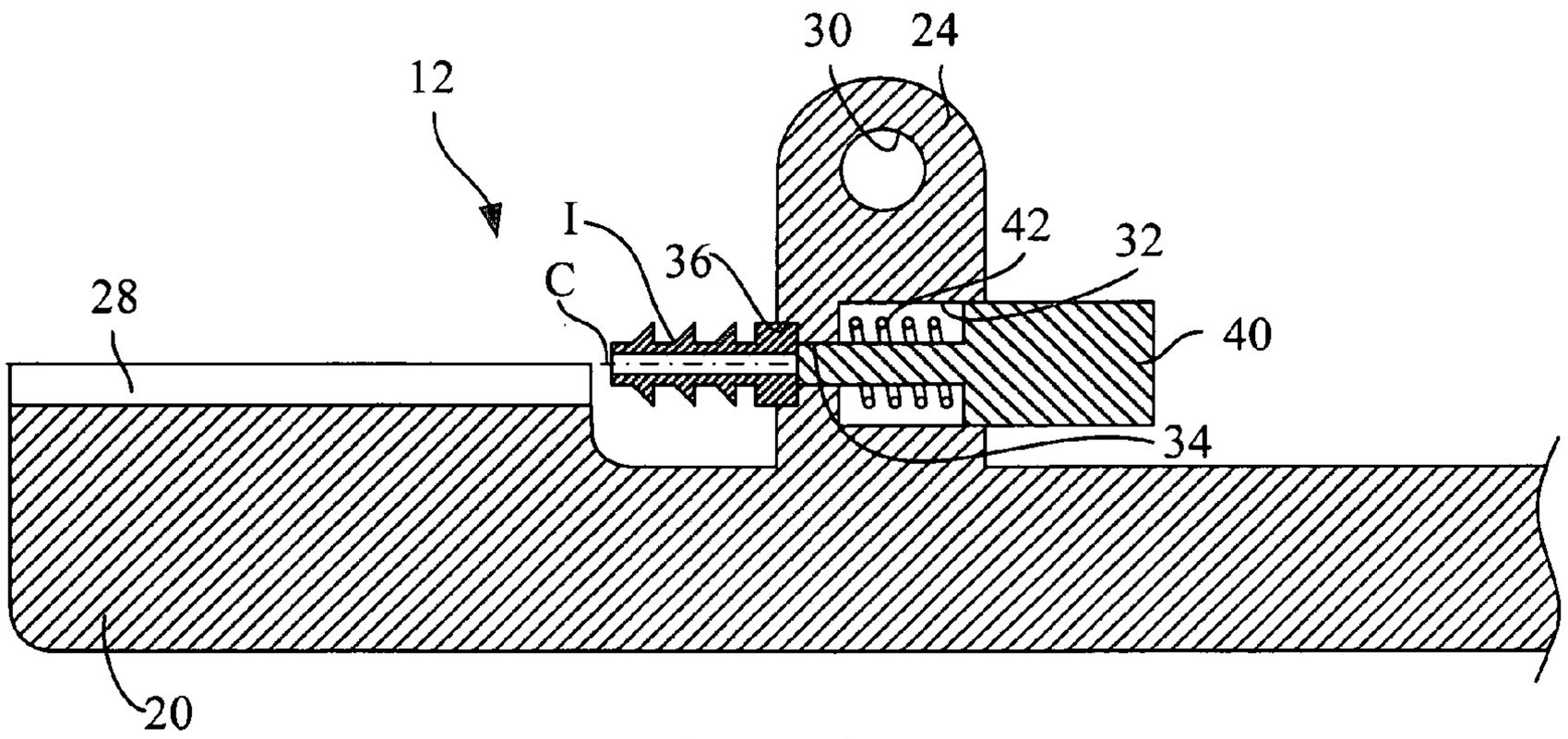


Fig. 4

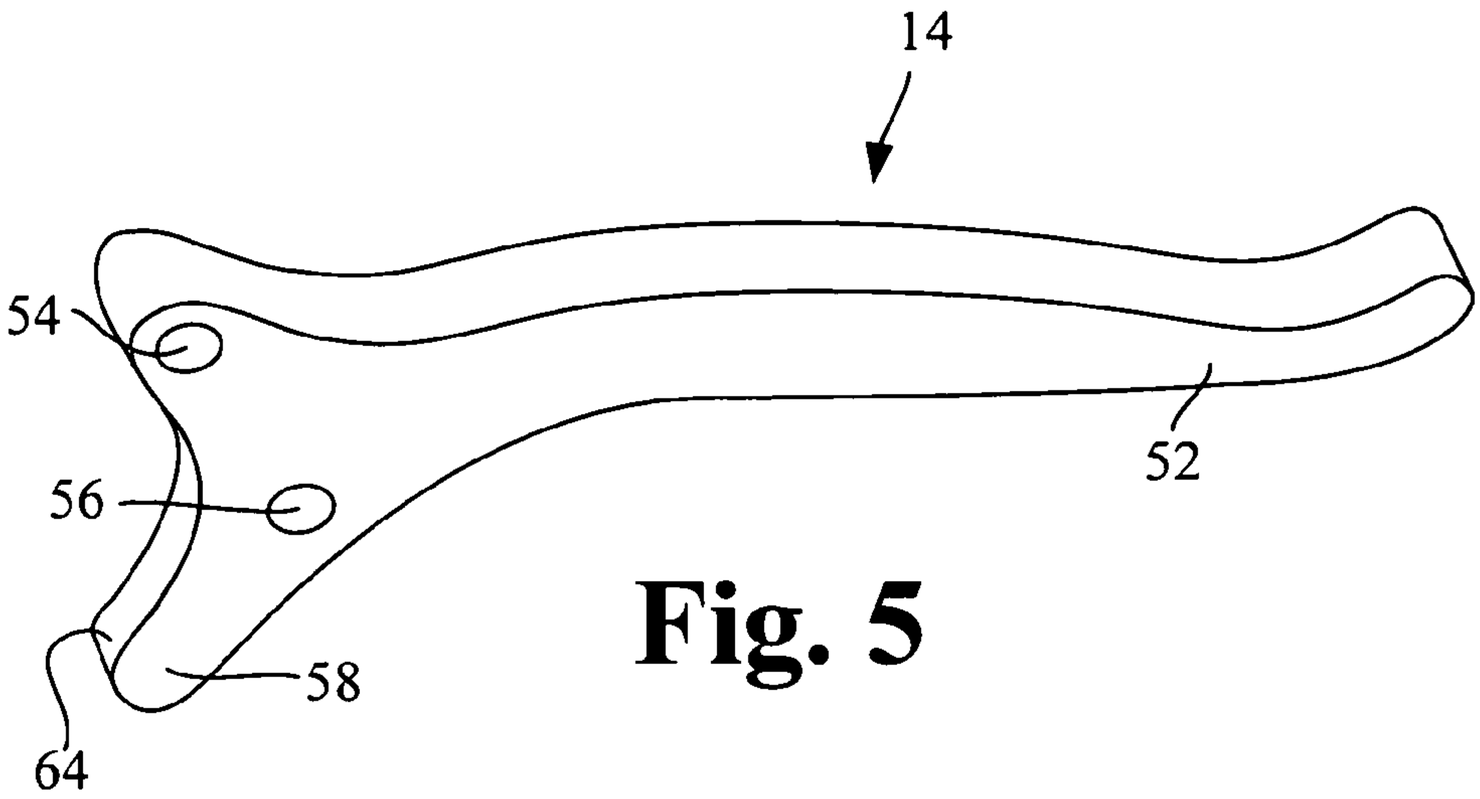


Fig. 5

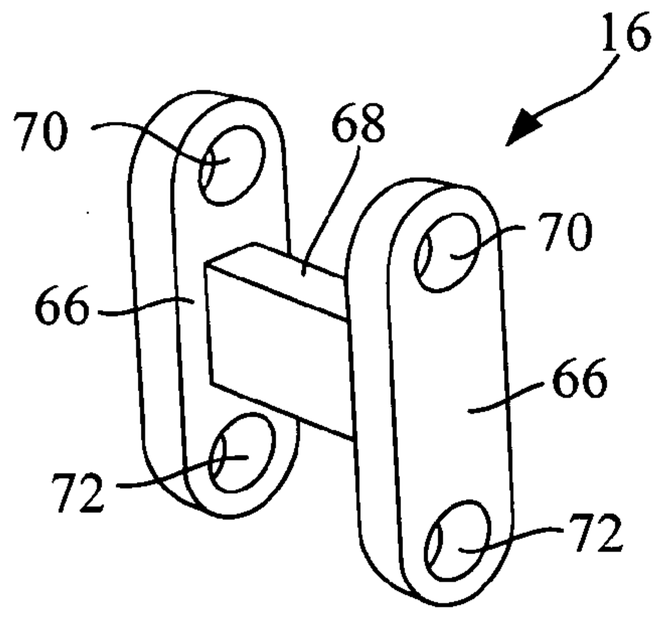


Fig. 6

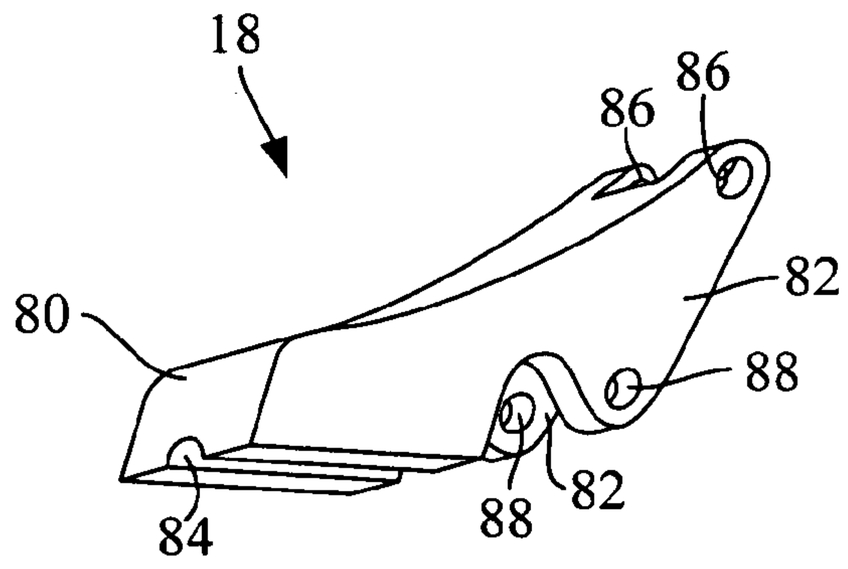


Fig. 7

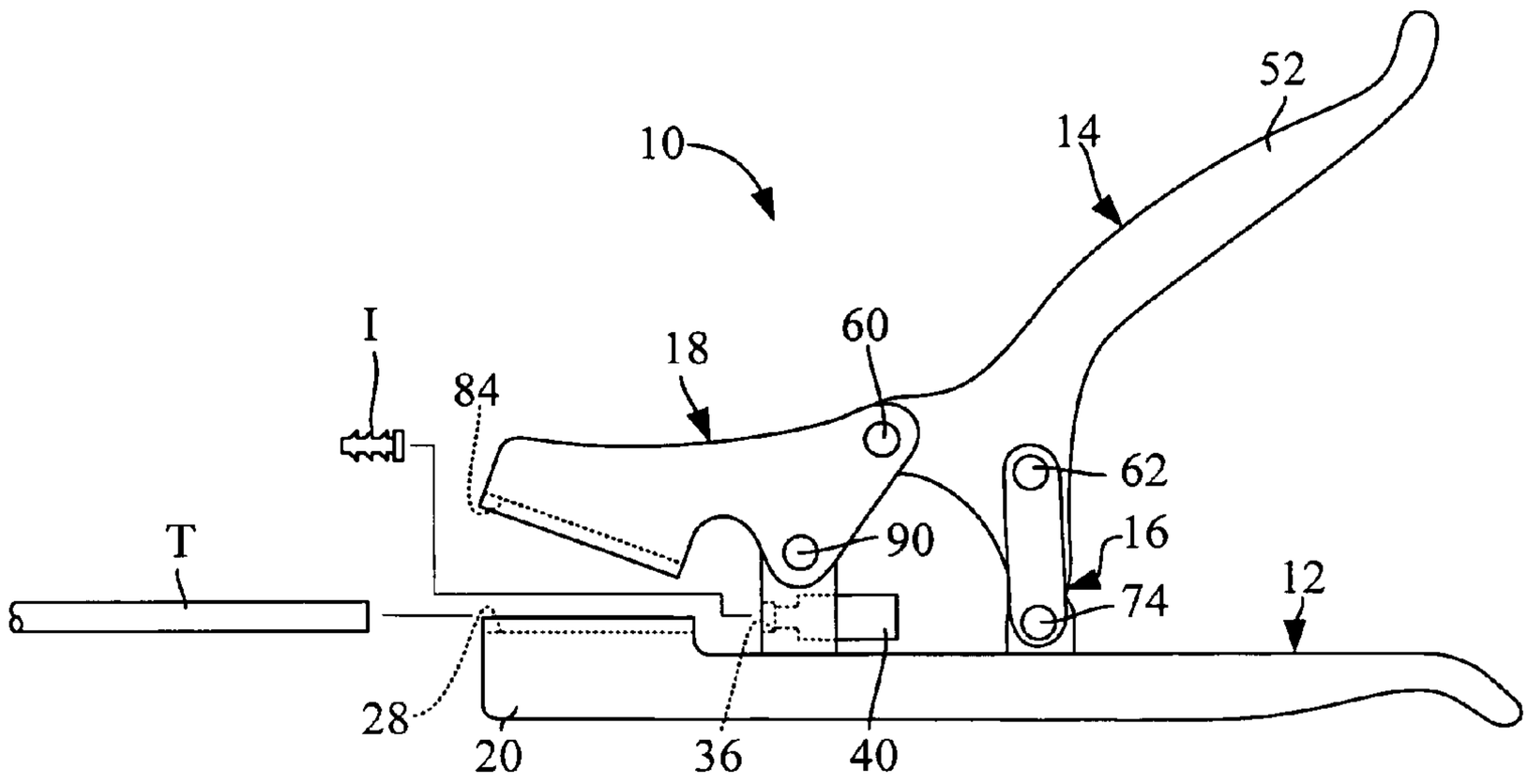

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Fig. 8

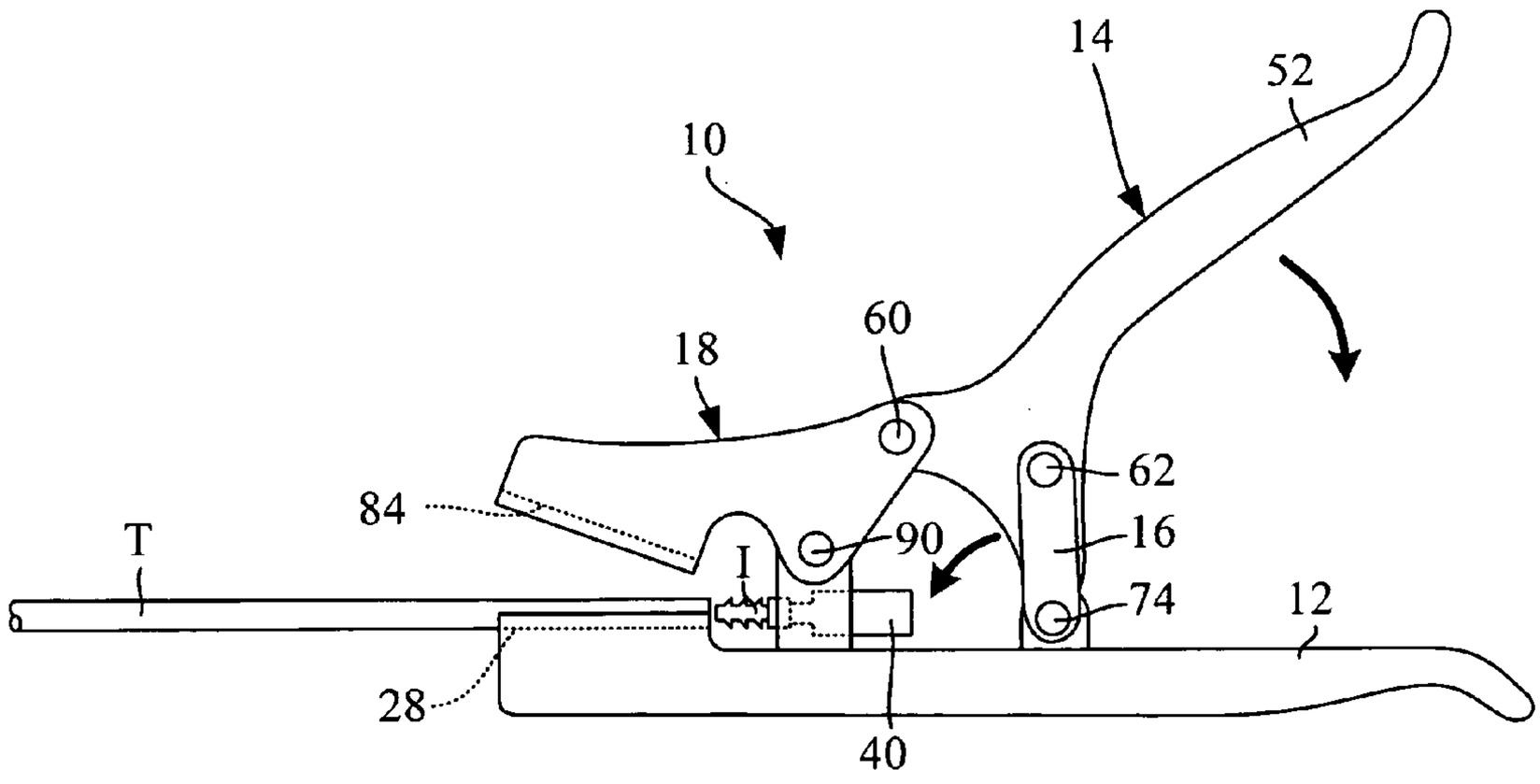
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Fig. 9

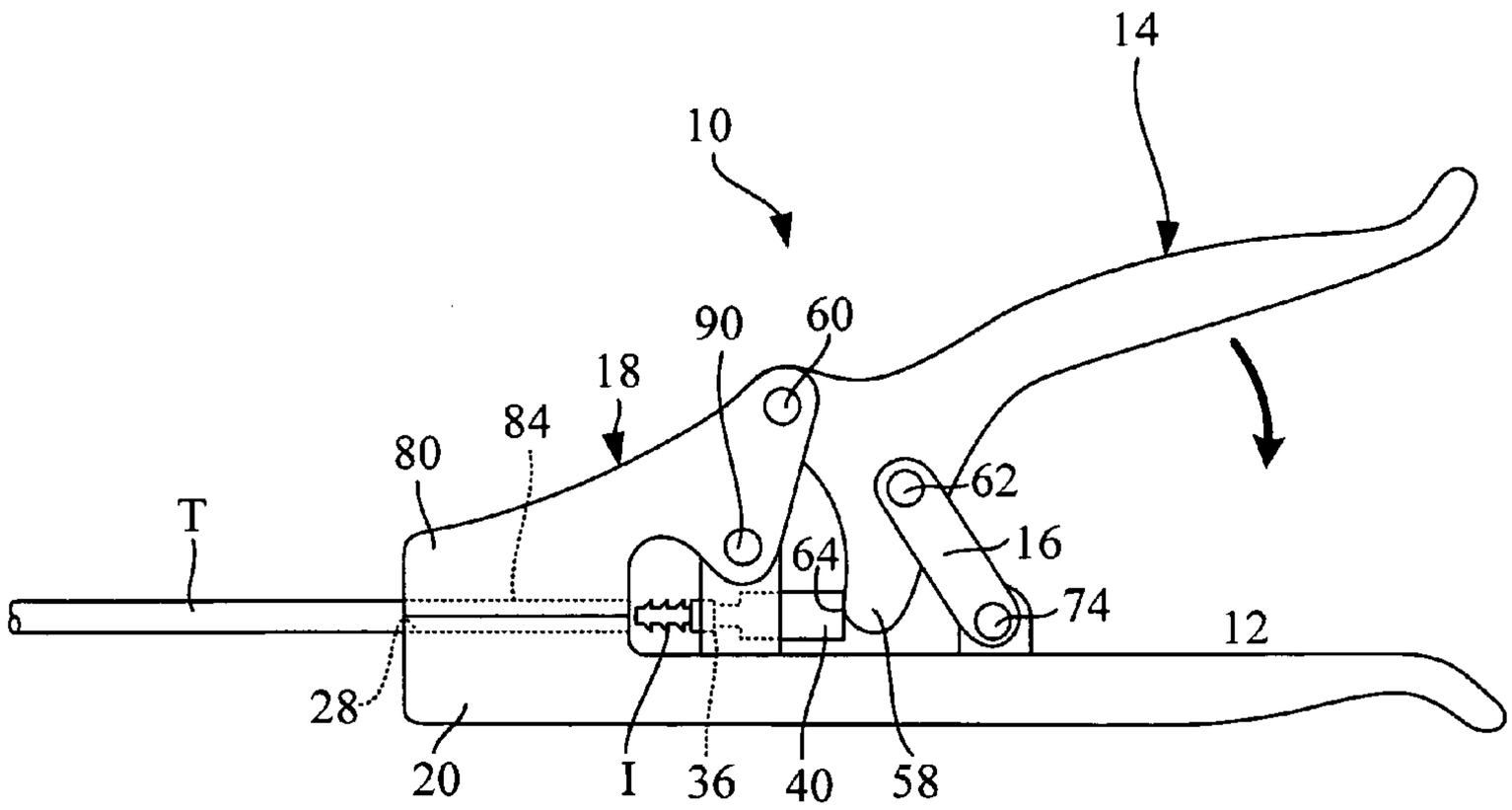
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Fig. 10

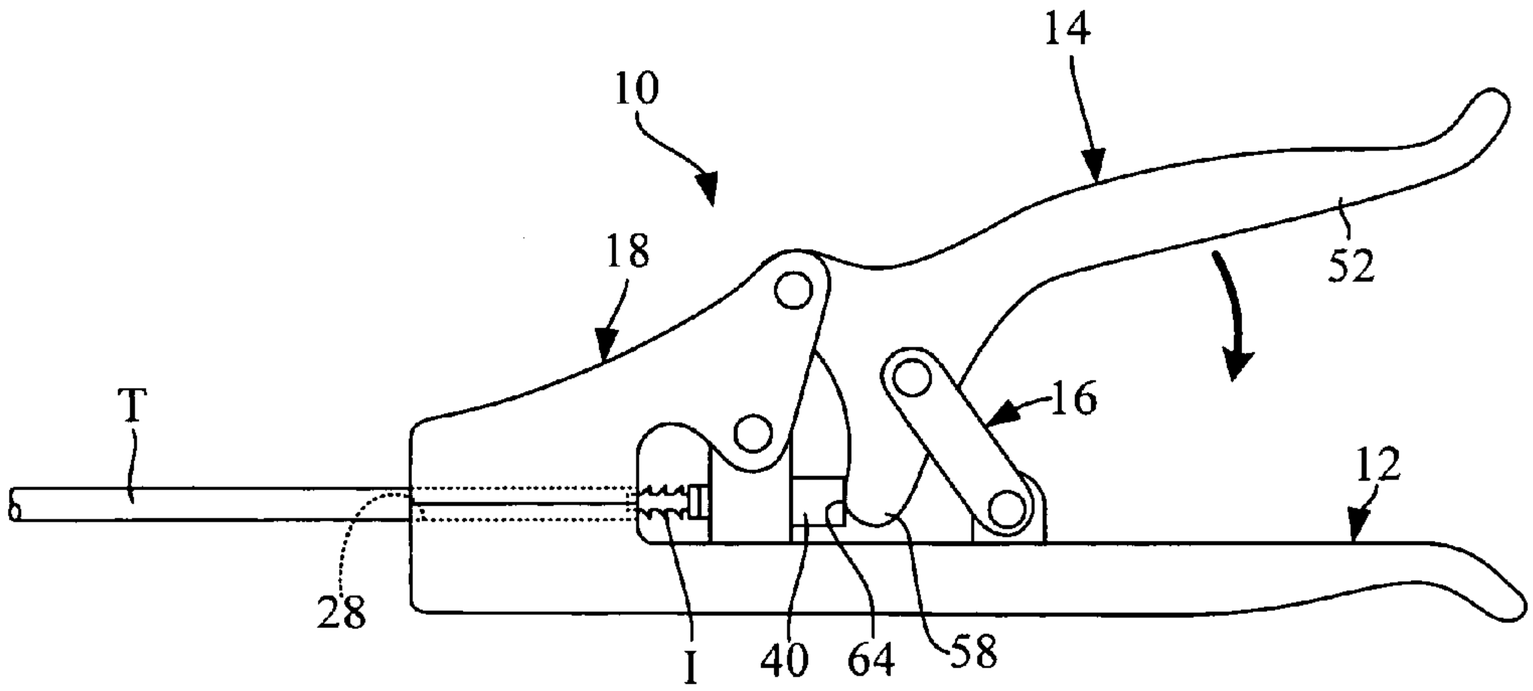
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Fig. 11

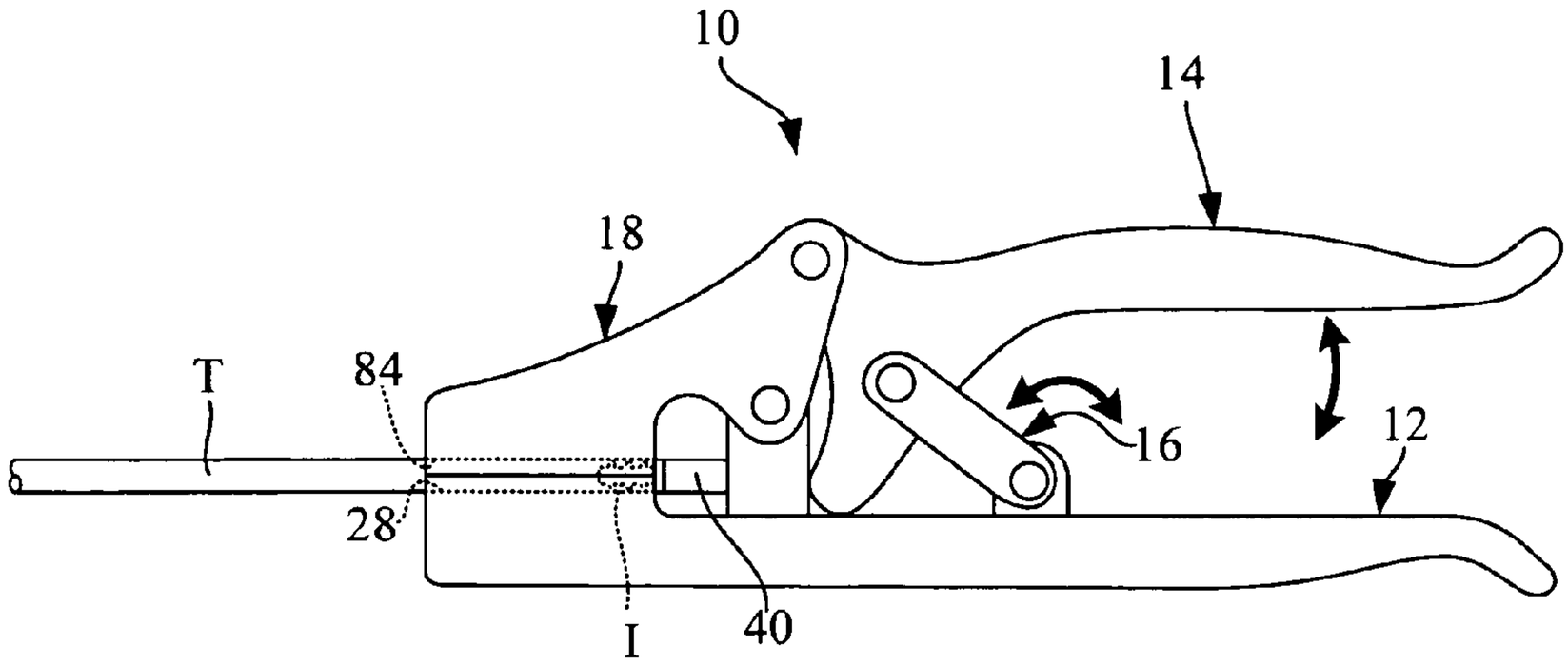

Fig. 12

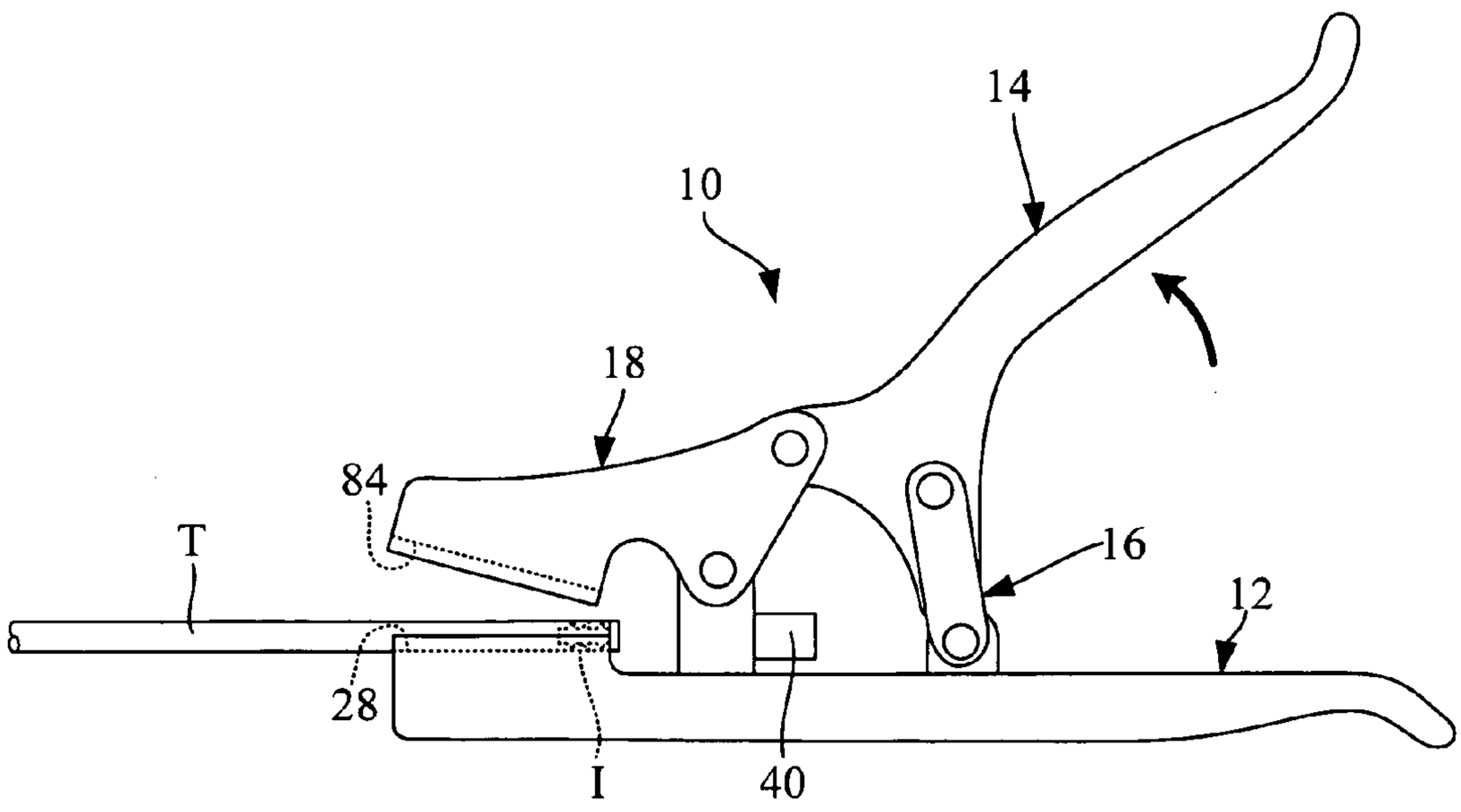

Fig. 13

TUBE INSERT INSTALLING TOOL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to a tube insert installing tool. More specifically, the present invention relates to tube insert installing tool that simultaneously grips a tube and installs an insert into the tube.

2. Background Information

Hydraulic tubes are well known for use in braking systems in vehicles and bicycles. Such tubes are typically light and flexible but require the installation of special fittings or inserts on their respective ends for proper installation and usage. Tools for installing inserts typically include two separate mechanisms, such as a gripping mechanism and a pressing mechanism. The gripping mechanism clamps or grips the tube and the other mechanism flares the end or presses an insert into the tube.

A problem with such tools is that the gripping mechanism and the pressing mechanism are separately operated requiring several operational steps. Operating such tools can be cumbersome and time consuming.

In view of the above, it will be apparent to those skilled in the art from this disclosure that there exists a need for an improved tool that simplifies the tube insert installing process. This invention addresses this need in the art as well as other needs, which will become apparent to those skilled in the art from this disclosure.

SUMMARY OF THE INVENTION

One object of the present invention is to configure a tube insert installing mechanism such that gripping a tube and installing an insert are accomplished in a simple and easy manner.

Another object of the present invention is to provide a tool with a gripping mechanism and an insert pressing mechanism that are operated by a single user actuation portion.

The foregoing objects can basically be attained by providing a tube insert installing tool with a first tube gripping portion, a second tube gripping portion, a tube insert supporting portion and a user actuation portion. The first and second tube gripping portions are configured to engage an end part of a tube. The tube insert supporting portion is configured to support a tube insert. The user actuation portion is operatively coupled to the first and second tube gripping portions to move the first and second tube gripping portions between an open release orientation and a tube gripping orientation. The user actuation portion includes an insert pressing part configured and arranged to push the tube insert supported by the tube insert supporting portion into the end part of the tube during subsequent movement of the user actuation portion in a single movement of the user actuation portion from the open release orientation to a final tube insertion orientation.

These and other objects, features, aspects and advantages of the present invention will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses a preferred embodiment of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the attached drawings which form a part of this original disclosure:

FIG. **1** is a perspective view of a tube insert installing tool operable between an open release orientation and a final tube insertion orientation, shown in a tube gripping orientation (an intermediate orientation) between the open release orientation and the final tube insertion orientation, with a movable gripping member and a gripping portion of a first operating member positioned to grip a tube and a pressing protrusion of a second operating member moved into contact with a pressing part of the first operating member in accordance with the present invention;

FIG. **2** is another perspective view showing the tube insert installing tool from a reverse angle, with the tube insert installing tool shown in the open release orientation in accordance with the present invention;

FIG. **3** is a side elevational view of the first operating member of the tube insert installing tool with other members removed to provide greater clarity in accordance with the present invention;

FIG. **4** is a cross sectional view of a portion of the first operating member of the tube inert installing tool taken along the line **4**—**4** in FIG. **3** in accordance with the present invention;

FIG. **5** is a perspective view of the second operating member of the tube insert installing tool with other members removed to provide greater clarity in accordance with the present invention;

FIG. **6** is a perspective view of a link member of the tube insert installing tool with other members removed to provide greater clarity in accordance with the present invention;

FIG. **7** is a perspective view of the movable gripping member of the tube insert installing tool with other members removed to provide greater clarity in accordance with the present invention;

FIG. **8** is a side elevational view of the tube insert installing tool shown in the open release orientation ready to receive a tube and a tube insert in accordance with the present invention;

FIG. **9** is a side elevational view of the tube insert installing tool shown in the open release orientation with the tube and the tube insert positioned therein with the second operating member and link member ready to be moved toward the final tube insertion orientation in accordance with the present invention;

FIG. **10** is a side elevational view of the tube insert installing tool shown in a tube gripping orientation (an intermediate orientation) between the open release orientation and the final tube insertion orientation, with the movable gripping member and a gripping portion of the first operating member gripping the tube and a pressing protrusion of the second operating member moved into contact with a pressing part of the first operating member in accordance with the present invention;

FIG. **11** is a side elevational view of the tube insert installing tool shown in a further intermediate orientation between the tube gripping orientation and the final tube insertion orientation, with the movable gripping member and a gripping portion of the first operating member gripping the tube and the pressing protrusion of the second operating member beginning to move the pressing part of the first operating member in accordance with the present invention;

FIG. **12** is a side elevational view of the tube insert installing tool shown in the final tube insertion orientation, with the pressing part of the first operating member forcing the insert into the tube in accordance with the present invention; and

FIG. **13** is a side elevational view of the tube insert installing tool shown returned to the open release orientation, with the insert inserted and retained in the tube in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Selected embodiments of the present invention will now be explained with reference to the drawings. It will be apparent to those skilled in the art from this disclosure that the following descriptions of the embodiments of the present invention are provided for illustration only and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

Referring initially to FIGS. **1** and **2**, a tube insert installing tool **10** is illustrated in accordance with a first embodiment of the present invention.

The tube insert installing tool **10** basically includes a first operating member **12**, a second operating member **14**, a pivot link **16** and a movable gripping member **18**. The second operating member **14** is pivotally coupled to the first operating member **12** by the pivot link **16**. The movable gripping member **18** is pivotally coupled to the first operating member **12** and pivotally coupled to the second operating member **14**. The second operating member **14** is pivotable or movable relative to the first operating member **12** between an open release orientation (shown in FIGS. **2**, **8**, **9** and **13**) and a final tube insertion orientation shown in FIG. **12**, as described in greater detail below. The tube insert installing tool **10** is configured and arranged to grip a tube T and push a tube insert I (FIGS. **8**–**13**) into an end part of the tube T (FIGS. **8**–**13**) in a single movement of second operating member **14** of the tube insert installing tool **10**, as described in greater detail below.

It should be understood from the drawings and the description herein that the first actuating portion **22** and the second actuating portion **52**, along with other portions of the tube insert installing **10** generally define a user actuation portion of the present invention.

With specific reference to FIGS. **3** and **4**, the first operating member **12** basically includes a first gripping portion **20**, a first actuating portion **22**, a first projection **24** and a second projection **26** (shown in FIG. **3**).

The first gripping portion **20** includes a surface formed with a semi-circular tube receiving recess **28** shown in FIGS. **1**–**4** and **8**–**13**. As shown in FIG. **4**, the recess **28** extends the length of the first gripping portion **20** from a distal end of the first gripping portion **20** toward the first projection **24**. The recess **28** has a central axis C and is dimensioned with a radius that is the same or slightly smaller that the radius of the tube T. The recess **28** is configured to work in concert with the movable gripping member **18** to selectively retain the tube T in a manner described in greater detail below.

Referring to again to FIG. **3**, the first actuating portion **22** (a first handle) basically includes an elongated handle having a curved end provided to accommodate an operator's hand.

With specific reference to FIG. **4**, the first projection **24** of the first operating member **12** basically includes a pivot pin bore **30**, a first bore **32**, a second bore **34** and an insert supporting recess **36**. As shown in FIG. **3**, the approximate center of the pivot pin bore **30** is located at a height H_1 above the surface of the first actuating portion **22**. The first and second bores **32** and **34** are oriented in a longitudinal direction parallel to the first actuating portion **22** and perpendicular to the lateral extending direction of the pivot pin bore **30**.

The first and second bores **32** and **34** are preferably concentric with the first bore **32** having a diameter larger than that of the second bore **34**. Further, the first and second bores **32** and **34** are preferably aligned with the central axis C of the recess **28**, as indicated in FIG. **4**. The insert supporting recess **36** is also concentric with the first and second bores **32** and **34**. The insert supporting recess **36** is dimensioned to receive and removably support the tube insert I. Preferably, the insert supporting recess **36** is a tube insert supporting portion dimensioned to snuggly receive and hold the head of the insert I therein.

As shown in FIG. **4**, a pressing part **40** and a return spring **42** are disposed within the first bore **32**. The pressing part **40** is an insert pressing part configured to push the insert I into the tube T in a manner described in greater detail below. The pressing part **40** is basically a piston that has two concentric portions, a large diameter portion and a smaller diameter portion. The large diameter portion of the pressing part **40** is slidably disposed generally within the first bore **32** and the smaller diameter portion slidably extends into the second bore **34**. When moved against the biasing of the return spring **42**, the pressing part **40** extends past the first projection **24** and the insert supporting recess **36** and toward the first gripping portion **20**, as indicated in FIG. **12**.

The spring **42** is disposed within the first bore **32** between the large diameter portion of the pressing part **40** and the second bore **34**. The spring **42** biases the pressing part **40** away from the insert supporting recess **36**.

With specific reference to FIG. **3**, the second projection **26** is formed with a pivot pin bore **50** that is preferably parallel to the pivot pin bore **30** of the first projection **24**. The approximate center of the pivot pin bore **50** is located at a height H_2 above the surface of the first actuating portion **22**. As shown in FIG. **3**, the height H_1 is greater than the height H_2.

With specific reference to FIG. **5**, the second operating member **14** basically includes a second actuating portion **52**, a first pivot bore **54**, a second pivot bore **56** and a pressing protrusion **58** (another insert pressing part). The second actuating portion **52** (a second handle) is a handle that includes has a curved end provided to accommodate an operator's hand. The first pivot bore **54** receives a first pivot pin **60** (FIGS. **1** and **2**) that pivotally couples the second operating member **14** to the movable gripping member **18**. The second pivot bore **56** is generally parallel to the first pivot bore **54** and receives a second pivot pin **62** (FIGS. **1** and **2**) that pivotally couples the second operating member **14** to the pivot link **16** and in a spaced apart manner to the first operating member **12**.

The pressing protrusion **58** extends below the second pivot bore **56** and includes a contact surface **64** configured for contacting the pressing part **40** upon movement of the second operating member **14** from the open release orientation (FIG. **8**) toward the tube gripping orientation (FIG. **12**). Specifically, the contact surface **64** is configured and arranged to initially be spaced from the insert pressing part **40** during movement from the open release orientation to a tube gripping orientation and to subsequently engage the insert pressing part **40** during movement from the tube gripping orientation to the final tube insertion orientation to move the insert pressing part **40**, which in turn urges the tube insert into the end part of the tube.

With reference to FIG. **6**, the pivot link **16** is now described. The pivot link **16** basically includes two generally

parallel link portions **66** and a gusset **68** extending therebetween. The link portions **66** are formed at opposite ends thereof with pivot pin bores **70** and **72**. The pivot pin bores **70** receive the second pivot pin **62** such that the pivot link **16** is pivotally coupled to the second operating member **14**. The pivot pin bores **72** receive a third pivot pin **74** (FIGS. **1** and **2**). The third pivot pin **74** further extends through the pivot pin bore **50** of the second projection **26** of the first operating member **12**. Consequently, the pivot link **16** is pivotally coupled to the first operating member **12**. Further, the second operating member **14** is pivotally coupled to the first operating member **12** via the pivot link **16**.

It should be understood from the drawings and the description herein that the pivot link **16** can alternatively include the link portions **66** without the gusset **68**. Specifically, the gusset **68** is an optional portion that can be omitted depending upon design considerations.

With reference to FIG. **7**, the movable gripping member **18** is now described. The movable gripping member **18** basically includes a second gripping portion **80** and a pair of generally parallel projections **82**. The second gripping portion **80** includes a semi-circular tube receiving recess **84**. Like the recess **28** of the first gripping portion **20** of the first operating member **12**, the recess **84** extends the length of the second gripping portion **80** from a distal end thereof to the parallel projections **82**. The recess **84** is dimensioned with a radius that is the same or slightly smaller that the radius of the tube T. The recess **84** is further configured to selectively retain the tube T in a manner described in greater detail below. The recesses **28** and **84** are parallel with one another and have parallel or very close common central axes when the first operating member **12** and the second operating member **14** are in the tube gripping orientation (FIG. **12**). Although not shown, with the first operating member **12** and the second operating member **14** in the tube gripping orientation, a central axis of the recess **84** preferably coincides with or is at least proximate the central axis C of the recess **28**.

The parallel projections **82** (lever parts) are formed with a first pair of pivot pin bores **86** (only one is shown in FIG. **7**) and a second pair of pivot pin bores **88**. The first pair of pivot pin bores **86** (a pivot section) receive the first pivot pin **60** thereby pivotally coupling the movable gripping member **18** to the first operating member **12**. The second pair of pivot pin bores **88** (another pivot section) received a fourth pivot pin **90**. The fourth pivot pin **90** further extends through the pivot pin bore **30** of the first projection **24** of the first operating member **12**, thereby pivotally coupling the movable gripping member **18** to the first operating member **12**.

The operation of the tube insert installing tool **10** is now described with specific reference to FIGS. **8**–**13**. In this operation, the tube insert I is press fitted into a hollow interior of the tube T.

With reference to FIG. **8**, the tube insert I is installed in the insert supporting recess **36** with the tube insert installing tool **10** in the open release orientation. Further, an end of the tube T is also placed in the recess **28** formed the first gripping portion **20** of the first operating member **12** with the tube insert installing tool **10** in the open release orientation.

As shown in FIG. **9**, with the tube insert I and the end of the tube T in position in the tube insert installing tool **10**, the second actuating portion **52** of the second operating member **14** can be moved toward the first actuating portion **22** of the first operating member **12**. During the initial movement from the open release orientation, the second actuating portion **52** of the second operating member **14** preferably pivots about the first pivot pin **60** urging the movable gripping member **18** to move toward the first gripping portion **20** of the first operating member **12** until the tube T engaged in the tube gripping orientation, shown in FIG. **10**.

As shown in FIG. **10**, the first gripping portion **20** and the second gripping portion **80** are brought into contact with the Tube T clamping it in position against axial movement. Specifically, the Tube T is confined within the recesses **28** and **84**. Continued movement of the second operating member **14** about the pivot pin **60** brings the pressing protrusion **58** into contact with the pressing part **40**. It should be understood from the drawings and description herein that the pivot link **16** also pivots about the third pivot pin **74** as the second operating member **14** moves into the tube gripping orientation depicted in FIG. **10**. Since the pressing part **40** is coaxial with the tube insert I (and the central axis C) the pressing part **40** pushes the tube insert I in a direction generally axially aligned with the tube receiving recesses **28** and **84**.

As shown in FIG. **11**, continued movement of the second actuating portion **52** of the second operating member **14** toward the first actuating portion **22** of the first operating member **12** causes the pressing protrusion **58** of the second operating member **14** to urge the pressing part **40** toward the first and second gripping portions **22** and **80**. Consequently, the tube insert I is pushed toward the Tube T and out of the insert supporting recess **36**.

As shown in FIG. **12**, continued movement of the second actuating portion **52** of the second operating member **14** toward the first actuating portion **22** of the first operating member **12** brings the tool insert installing tool **10** to the final tube insertion orientation. Movement to the final tube insertion orientation causes the pressing protrusion **58** to urge the pressing part **40** further toward the first and second gripping portions **22** and **80**. Consequently, the tube insert I is pressed into the Tube T.

As shown in FIG. **13**, with the second actuating portion **52** of the second operating member **14** released and the tool insert installing tool **10** returned to the open release orientation, the Tube T can be easily removed from the tool with the tube insert I conveniently installed in the Tube T. Accordingly, the user actuation portion (the first and second actuating portions **22** and **52**) are operatively coupled to the first and second tube gripping portions **20** and **80** to move the first and second tube gripping portions **20** and **80** between the open release orientation and the tube gripping orientation. Further, the pressing part **40** is configured and arranged to push the tube insert I into the end part of the tube T during subsequent movement of the user actuation portion in a single movement of the user actuation portion from the open release orientation to a final tube insertion orientation.

In understanding the scope of the present invention, the term "configured" as used herein to describe a component, section or part of a device dimensioned to carry out the desired function. In understanding the scope of the present invention, the term "comprising" and its derivatives, as used herein, are intended to be open ended terms that specify the presence of the stated features, elements, components, groups, integers, and/or steps, but do not exclude the presence of other unstated features, elements, components, groups, integers and/or steps. The foregoing also applies to words having similar meanings such as the terms, "including", "having" and their derivatives. Also, the terms "part," "section," "portion," "member" or "element" when used in the singular can have the dual meaning of a single part or a plurality of parts. As used herein to describe the present invention, the following directional terms "forward, rearward, above, downward, vertical, horizontal, below and

transverse" as well as any other similar directional terms refer to those directions of a to according to the tool of the present invention. Finally, terms of degree such as "substantially", "about" and "approximately" as used herein mean a reasonable amount of deviation of the modified term such that the end result is not significantly changed. For example, these terms can be construed as including a deviation of at least ±5% of the modified term if this deviation would not negate the meaning of the word it modifies.

While only selected embodiments have been chosen to illustrate the present invention, it will be apparent to those skilled in the art from this disclosure that various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims. Furthermore, the foregoing descriptions of the embodiments according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

What is claimed is:

1. A tube insert installing tool comprising:

a first tube gripping portion configured to engage an end part of a tube;

a second tube gripping portion configured to engage the end part of the tube;

a tube insert supporting portion configured to support a tube insert; and

a user actuation portion operatively coupled to the first and second tube gripping portions to move the first and second tube gripping portions between an open release orientation and a tube gripping orientation,

the user actuation portion including an insert pressing part configured and arranged to push the tube insert supported by the tube insert supporting portion into the end part of the tube during subsequent movement of the user actuation portion in a single movement of the user actuation portion from the open release orientation to a final tube insertion orientation, the user actuation portion further including a contact portion that is configured and arranged to initially be spaced from the insert pressing part during movement from the open release orientation to the tube gripping orientation and to subsequently engage the insert pressing part during movement from the gripping orientation to the final tube insertion orientation to move the insert pressing part, which in turn urges the tube insert into the end part of the tube.

2. The tube insert installing tool as set forth in claim **1**, wherein

the first gripping portion includes a tube receiving recess; and

the insert pressing part is configured to push the tube insert in a direction generally axially aligned with the tube receiving recess.

3. The tube insert installing tool as set forth in claim **1**, wherein

the user actuation portion includes a first handle and a second handle pivotally coupled to one another, the first gripping portion being fixedly coupled to a distal end of the first handle relative to the second handle.

4. The tube insert installing tool as set forth in claim **3**, wherein

the second tube gripping portion includes a lever part having a first pivot section pivotally coupled to the first handle and a second pivot section pivotally coupled to the second handle.

5. The tube insert installing tool as set forth in claim **3**, further comprising

a link having a first end pivotally coupled to the first handle and a second end pivotally coupled to the second handle.

6. The tube insert installing tool as set forth in claim **5**, wherein

the second tube gripping portion includes a lever part having a first pivot section pivotally coupled to the first handle and a second pivot section pivotally coupled to the second handle.

7. The tube insert installing tool as set forth in claim **3**, wherein

the first handle includes an elongated portion formed with a first projection and a second projection, the second tube gripping portion being pivotally coupled to the first projection and the second handle being pivotally coupled to the second projection.

8. The tube insert installing tool as set forth in claim **7**, further comprising

a link having a first end pivotally coupled to the second projection of the first handle and a second end pivotally coupled to the second handle.

9. The tube insert installing tool as set forth in claim **8**, wherein

the second tube gripping portion includes a lever part having a first pivot section pivotally coupled to the first projection of the first handle and a second pivot section pivotally coupled to the second handle.

10. The tube insert installing tool as set forth in claim **7**, wherein

the tube insert supporting portion is fixedly attached to the first handle between the first projection and the first tube gripping portion.

11. The tube insert installing tool as set forth in claim **7**, wherein

the first projection extends a first distance away from the from the elongated portion and the second projection extends a second distance away from the elongated portion, the first distance being greater than the second distance.

12. The tube insert installing tool as set forth in claim **1**, further comprising

a link having a first end pivotally coupled to the first grip portion and a second end pivotally coupled to the second grip portion to support the second grip portion in a spaced apart relationship from the first grip portion.

13. A tube insert installing tool comprising:

a first tube gripping portion configured to engage an end part of a tube;

a second tube gripping portion configured to engage the end part of the tube;

a tube insert supporting portion configured to support a tube insert;

a user actuation portion operatively coupled to the first and second tube gripping portions to move the first and second tube gripping portions between an open release orientation and a tube gripping orientation, and

a link having a first end pivotally coupled to the first grip portion and a second end pivotally coupled to the second grip portion to support the second grip portion in a spaced apart relationship from the first grip portion,

the user actuation portion including an insert pressing part configured and arranged to push the tube insert supported by the tube insert supporting portion into the end part of the tube during subsequent movement of the user actuation portion in a single movement of the user

actuation portion from the open release orientation to a final tube insertion orientation.

14. The tube insert installing tool as set forth in claim **13**, wherein

the first gripping portion includes a tube receiving recess; and

the insert pressing part is configured to push the tube insert in a direction generally axially aligned with the tube receiving recess.

15. The tube insert installing tool as set forth in claim **13**, wherein

the user actuation portion includes a first handle and a second handle pivotally coupled to one another, the first gripping portion being fixedly coupled to a distal end of the first handle relative to the second handle.

16. The tube insert installing tool as set forth in claim **15**, wherein

the second tube gripping portion includes a lever part having a first pivot section pivotally coupled to the first handle and a second pivot section pivotally coupled to the second handle.

17. The tube insert installing tool as set forth in claim **15**, wherein

the first handle includes an elongated portion formed with a first projection and a second projection, the second tube gripping portion being pivotally coupled to the first projection and the second handle being pivotally coupled to the second projection.

18. The tube insert installing tool as set forth in claim **17**, wherein

the tube insert supporting portion is fixedly attached to the first handle between the first projection and the first tube gripping portion.

19. The tube insert installing tool as set forth in claim **17**, wherein

the first projection extends a first distance away from the from the elongated portion and the second projection extends a second distance away from the elongated portion, the first distance being greater than the second distance.

20. The tube insert installing tool as set forth in claim **13**, wherein

the user actuation portion includes a contact portion that is configured and arranged to initially be spaced from the insert pressing part during movement from the open release orientation to the tube gripping orientation and to subsequently engage the insert pressing part during movement from the gripping orientation to the final tube insertion orientation to move the insert pressing part, which in turn urge the tube insert into the end part of the tube.

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